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**Shimizu et al.**

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(54) **WATERPROOF COMPONENT WITH WIRING STRUCTURE**

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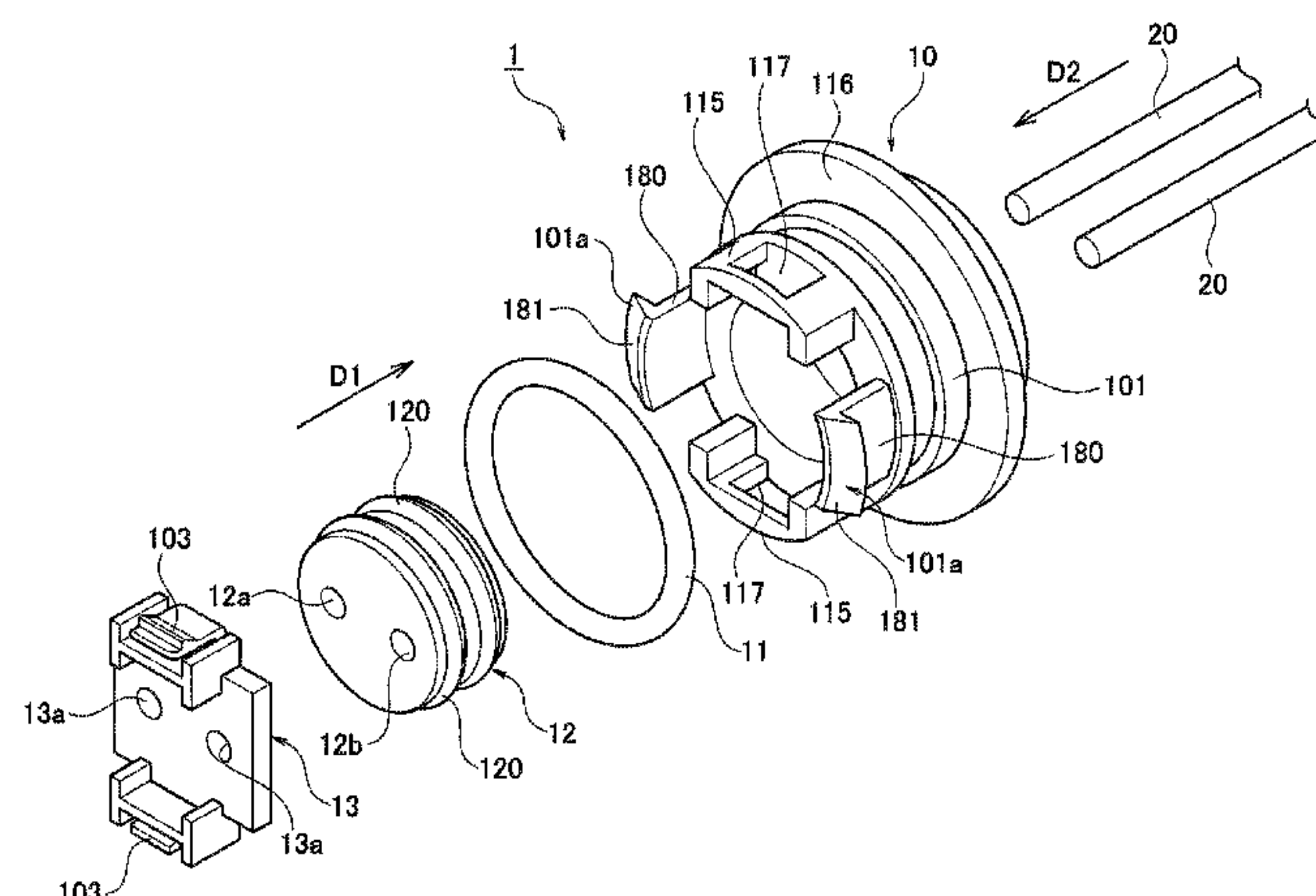
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(57) **ABSTRACT**

A waterproof component includes a housing body, a mat seal, mat seal cover, and an elastic ring. The housing body includes an attachment-hole-insertion portion having a mat-seal-accommodating chamber, an abutting portion to abut a first peripheral surface of the attachment hole, a locking claw provided on an insertion tip side of the attachment hole insertion portion, the locking claw to be locked to a second peripheral surface of the attachment hole, and a cover locking portion provided on an insertion tip side of the attachment-hole-insertion portion. The mat seal has an electric wire press-fitting hole. The mat-seal-accommodating chamber accommodates the mat seal. The mat seal cover locks to the cover-locking portion, the mat seal cover interposes the mat seal between the mat seal cover and a bottom wall of the mat-seal-accommodating chamber. The elastic ring is disposed on an outer periphery of the attachment-hole-insertion portion.

**2 Claims, 6 Drawing Sheets**



<div>(51) <b>Int. Cl.</b> <i>H01R 13/516</i> (2006.01) <i>H01R 13/74</i> (2006.01) <i>H02G 3/22</i> (2006.01) <i>B60R 16/02</i> (2006.01)  (52) <b>U.S. Cl.</b> CPC ..... <i>H01R 13/521</i> (2013.01); <i>H01R 13/5202</i> (2013.01); <i>H01R 13/5213</i> (2013.01); <i>H01R</i> <i>13/743</i> (2013.01); <i>H02G 3/22</i> (2013.01)  (58) <b>Field of Classification Search</b> CPC ..... H01R 13/5202; H01R 13/748; H01R 13/745; H02G 15/013; H02G 3/22 USPC ..... 439/284, 544, 553–557, 559, 564, 565; 174/77 R, 151 See application file for complete search history.</div>	<div>(56) <b>References Cited</b>  U.S. PATENT DOCUMENTS  5,631,445 A * 5/1997 Herster ..... B60R 16/0222 174/151 5,890,922 A * 4/1999 Buchter ..... H01R 13/504 439/284 6,860,759 B2 * 3/2005 Nakamura ..... H01R 13/745 439/557 7,090,533 B1 * 8/2006 Houck ..... H01R 13/743 439/546 7,318,748 B2 * 1/2008 Yamakado ..... H01R 13/743 439/552 9,017,099 B2 * 4/2015 Ikeda ..... H01R 25/162 439/559 9,484,647 B2 * 11/2016 Ishikawa ..... H01R 13/502 2011/0300731 A1 12/2011 Nakamura  * cited by examiner</div>
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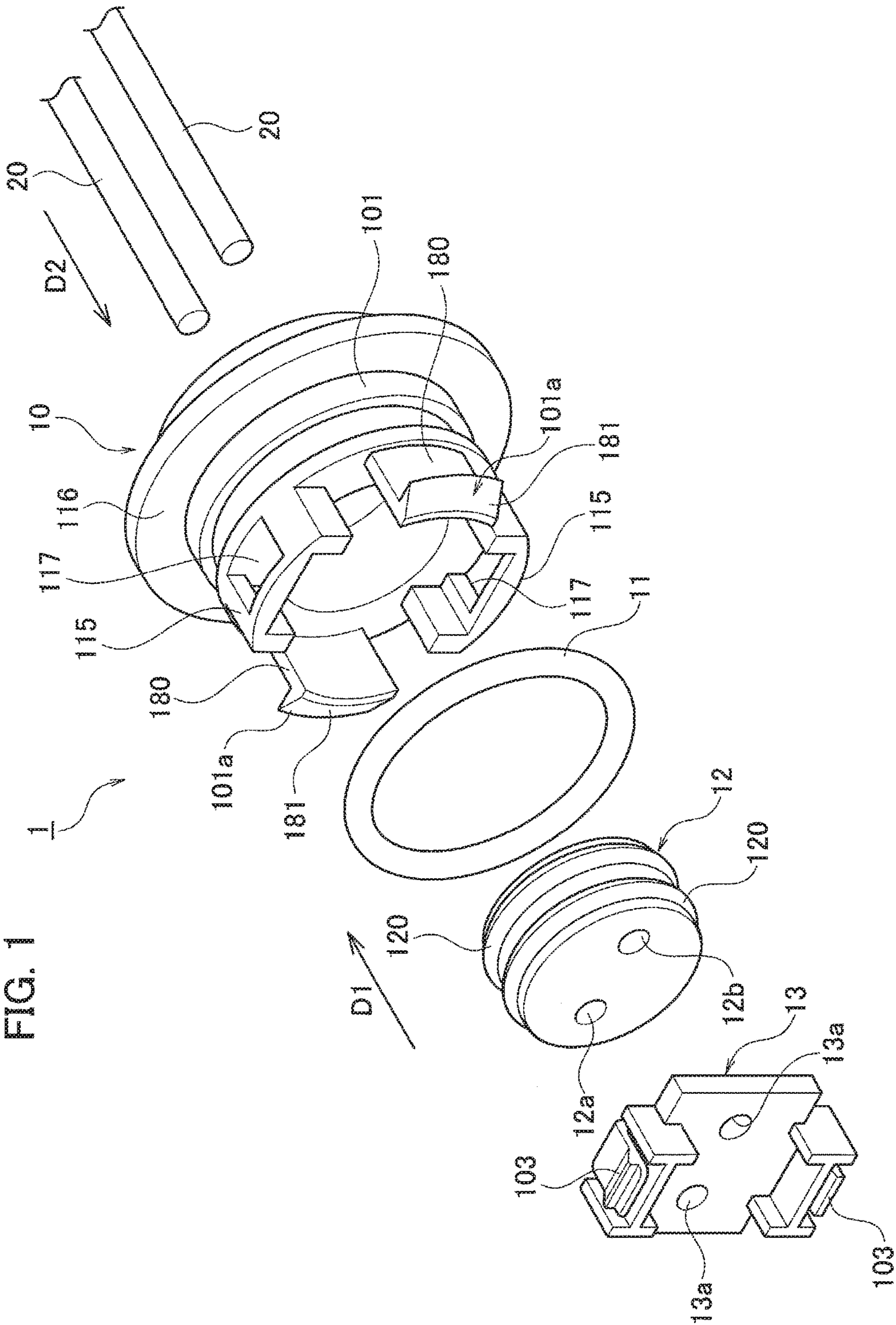


FIG. 2

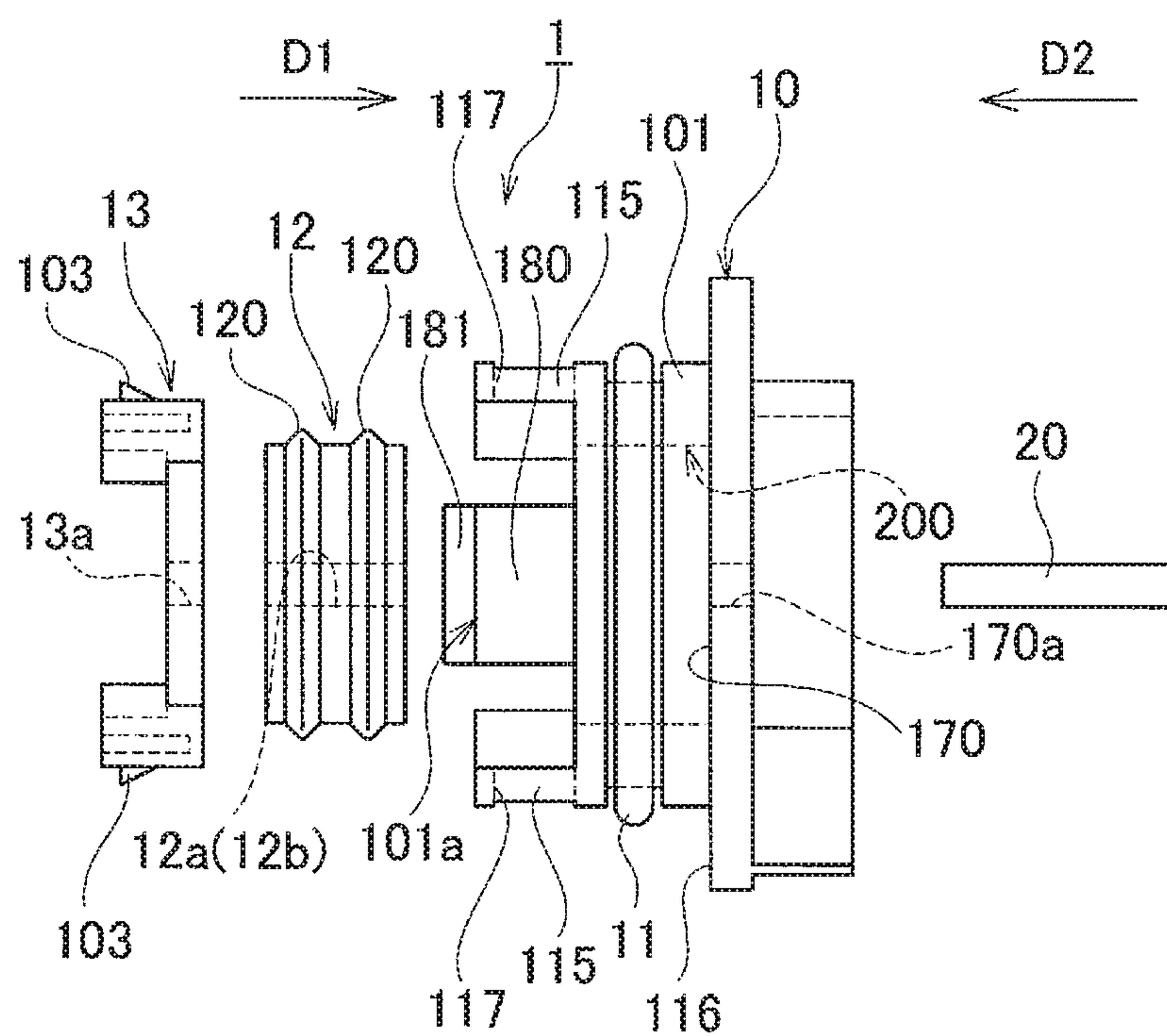




FIG. 3

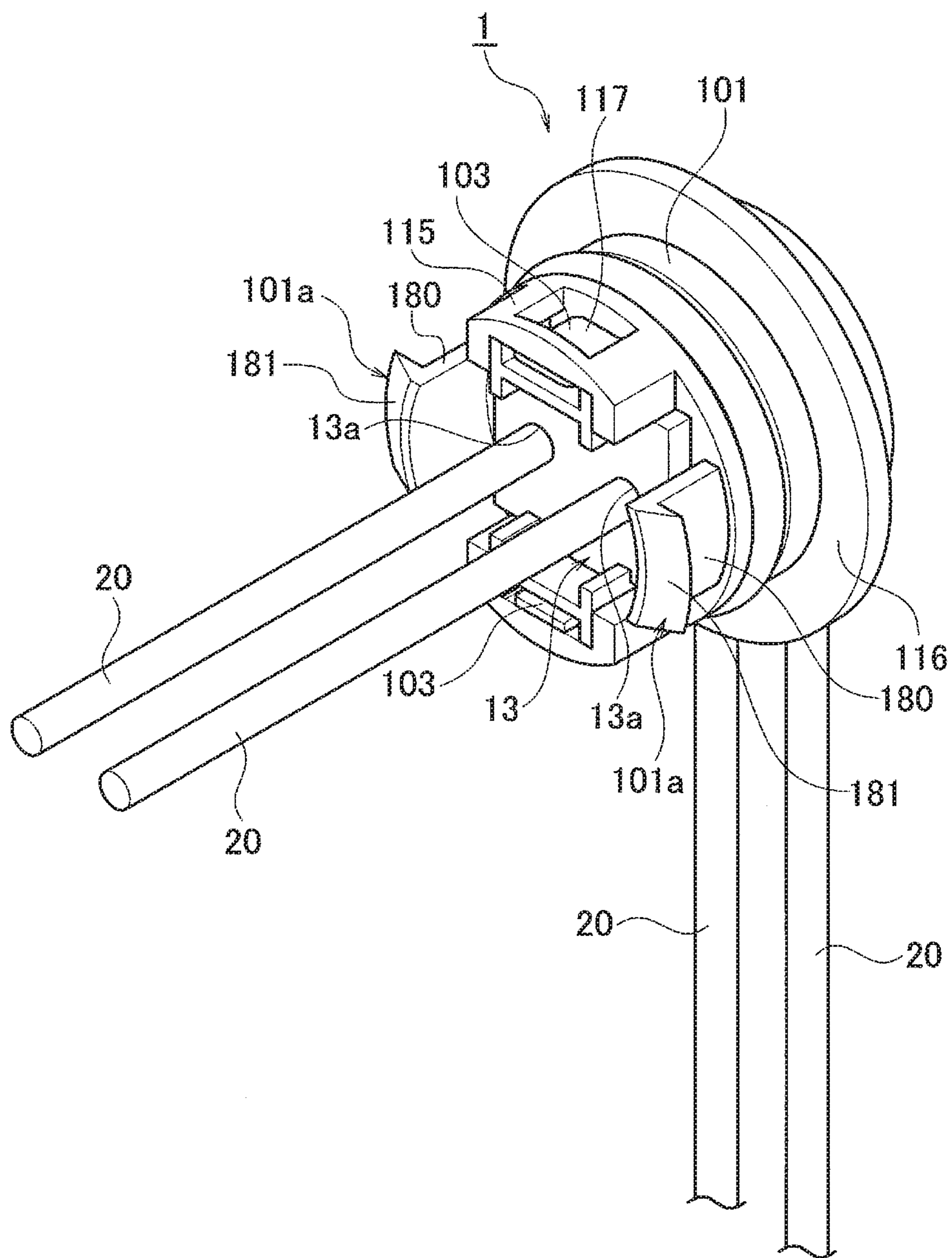


FIG. 4

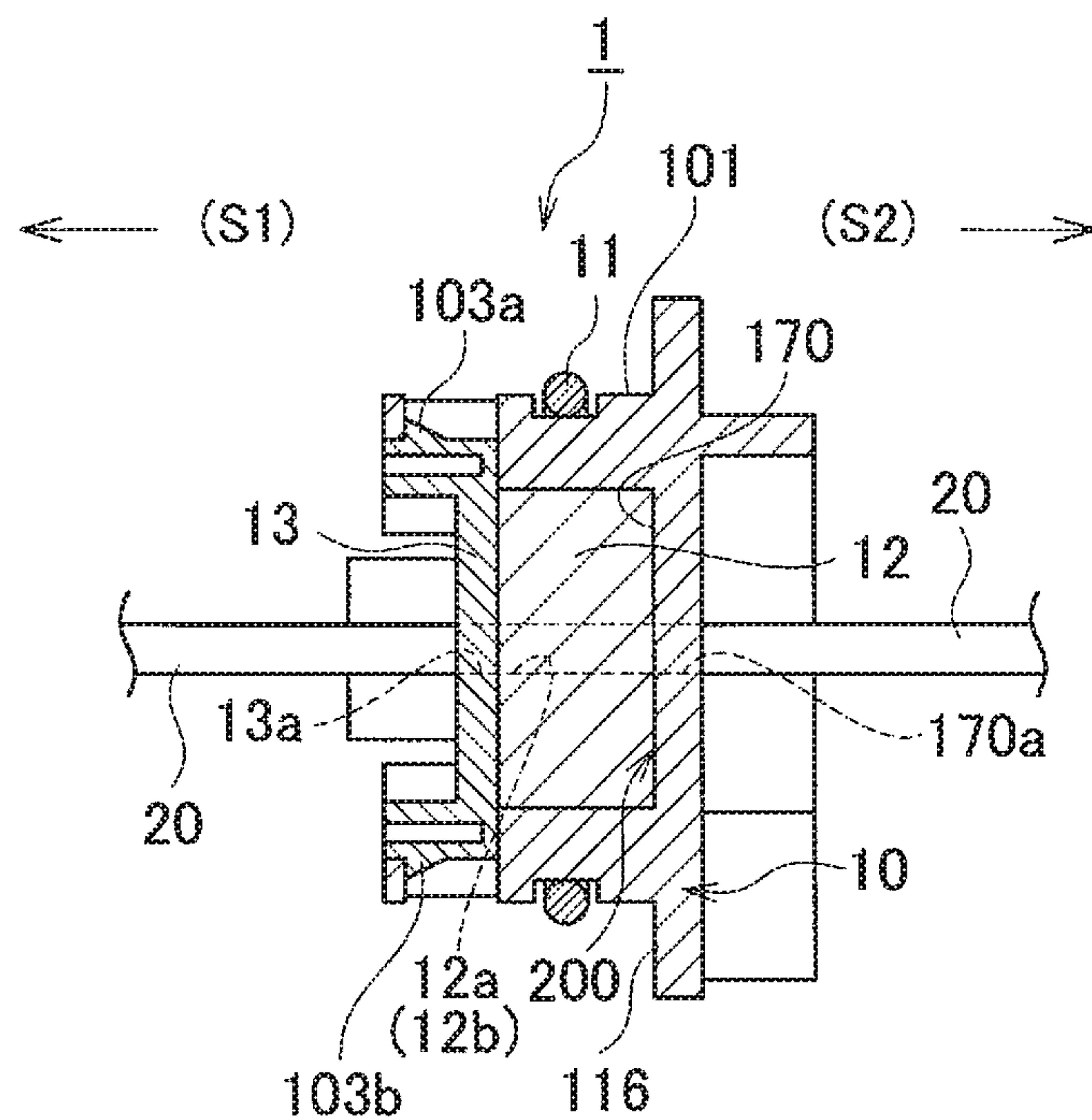


FIG. 5A

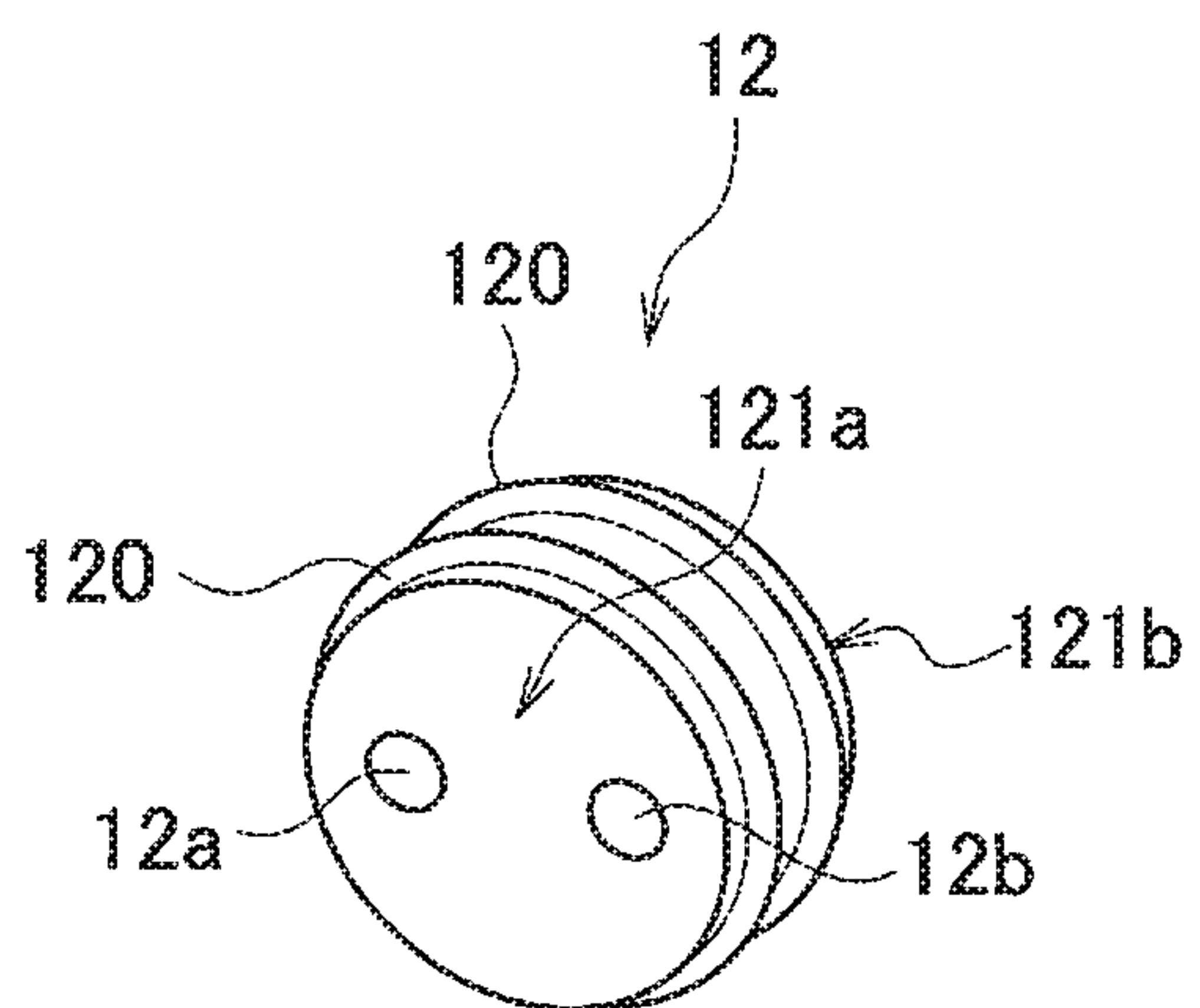


FIG. 5B

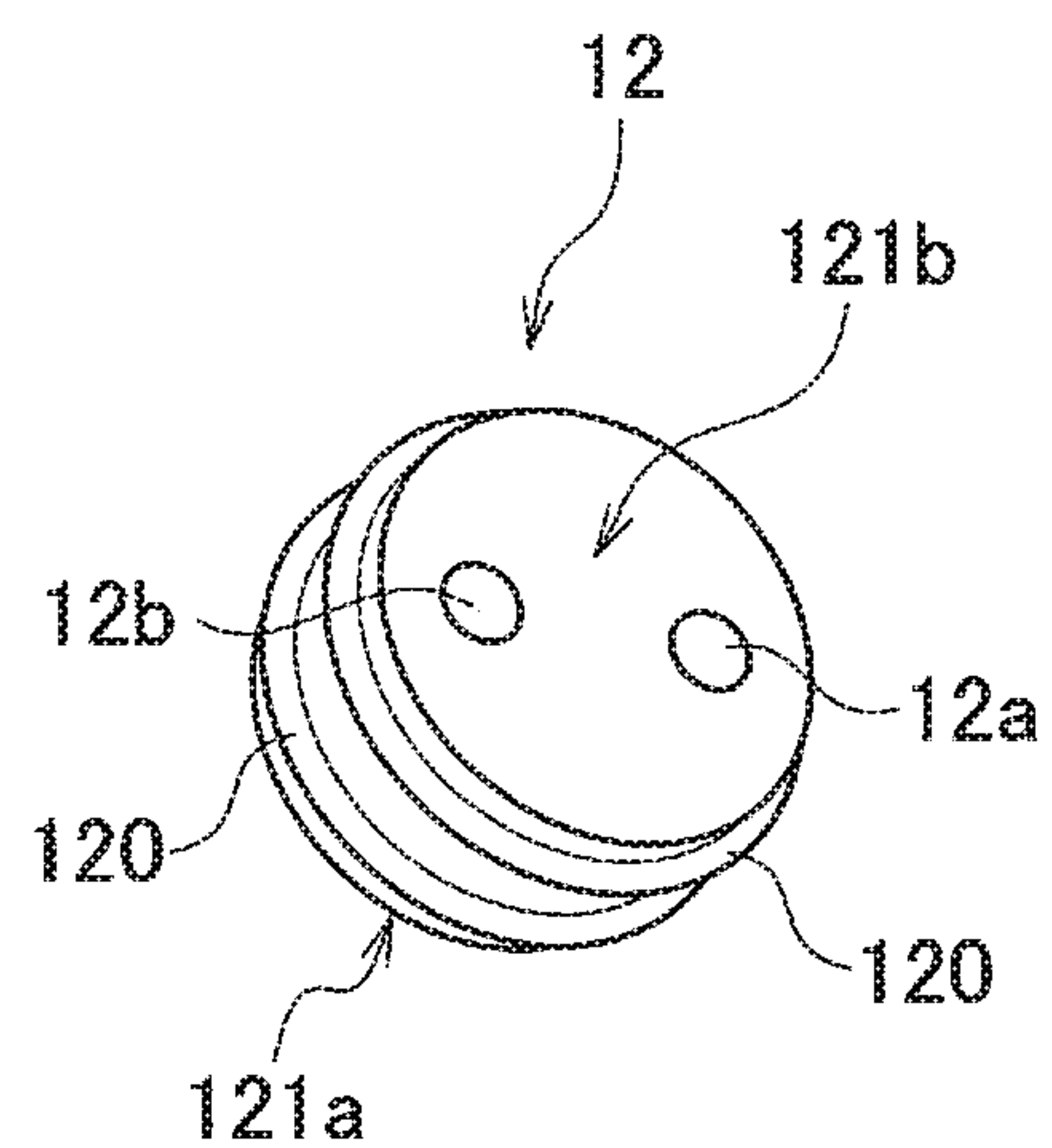


FIG. 6A

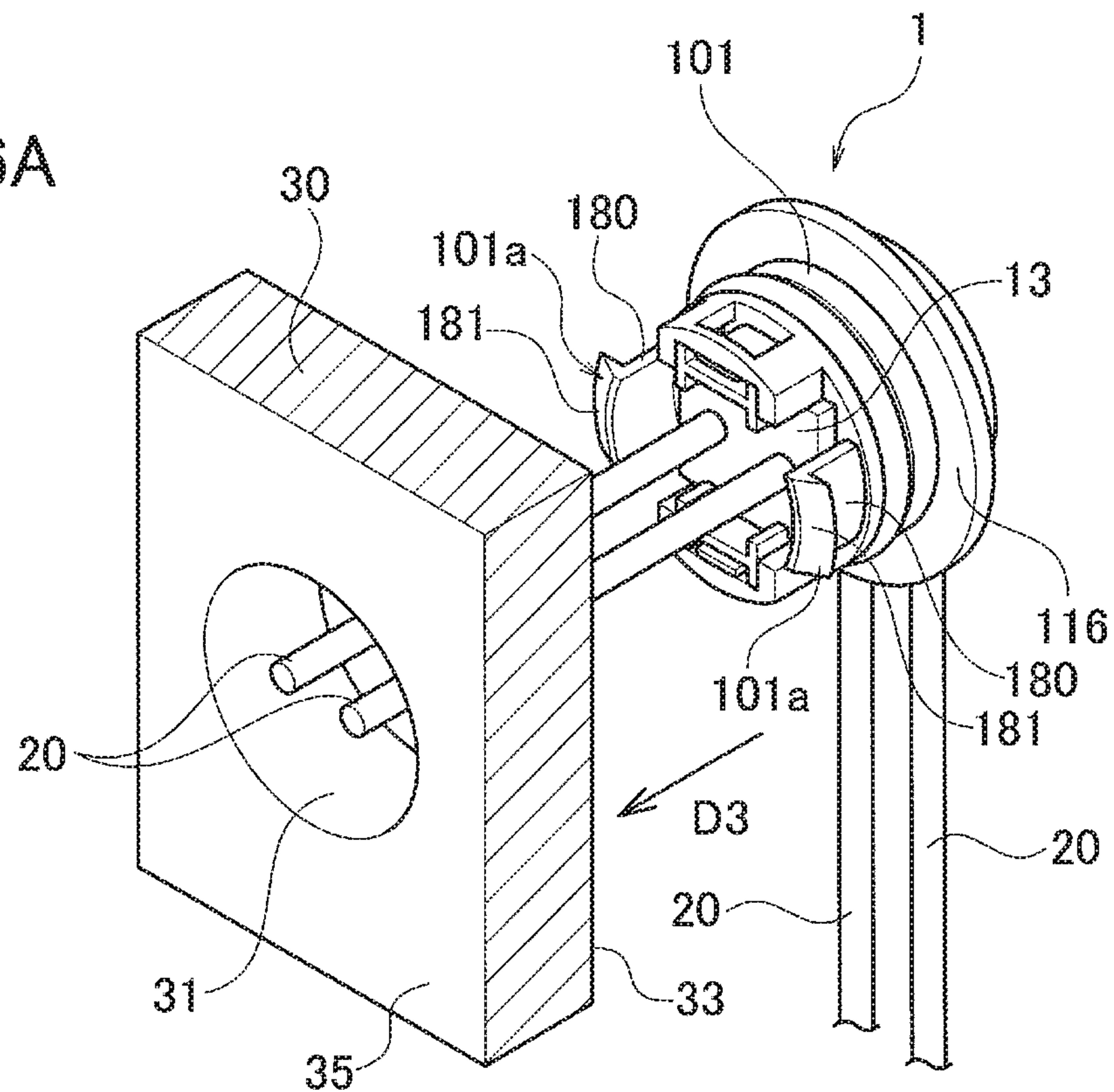


FIG. 6B

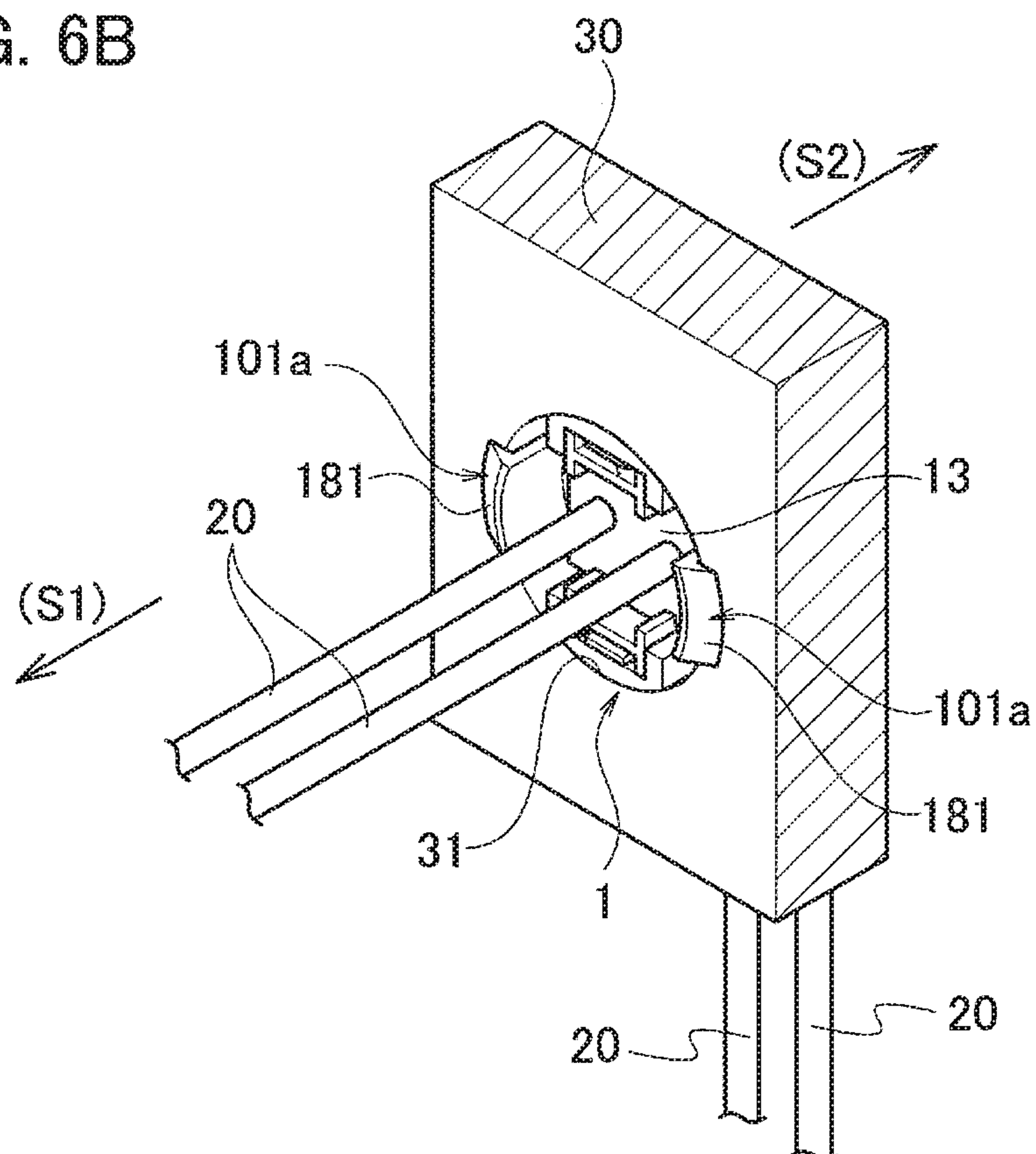




FIG. 7A

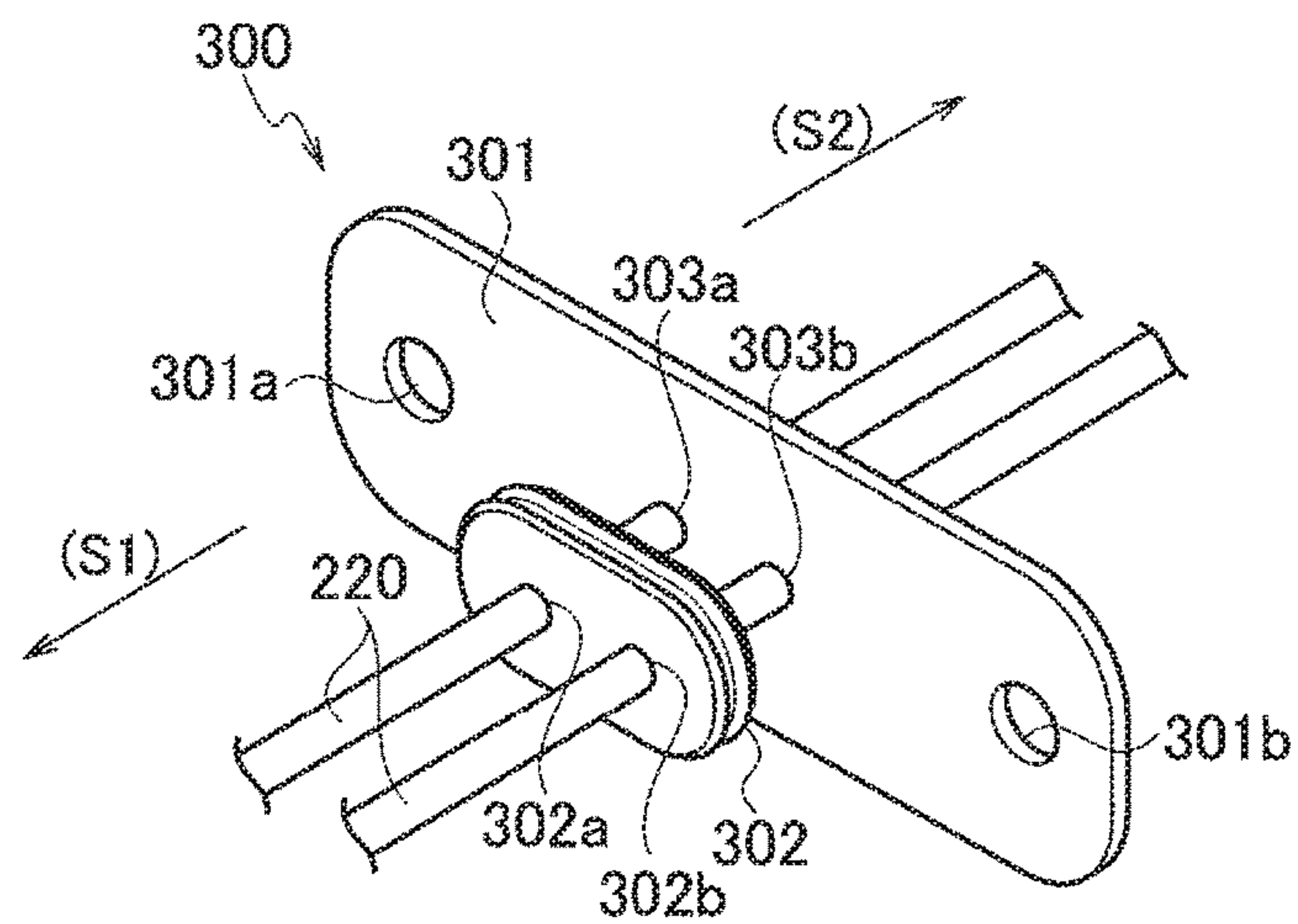


FIG. 7B

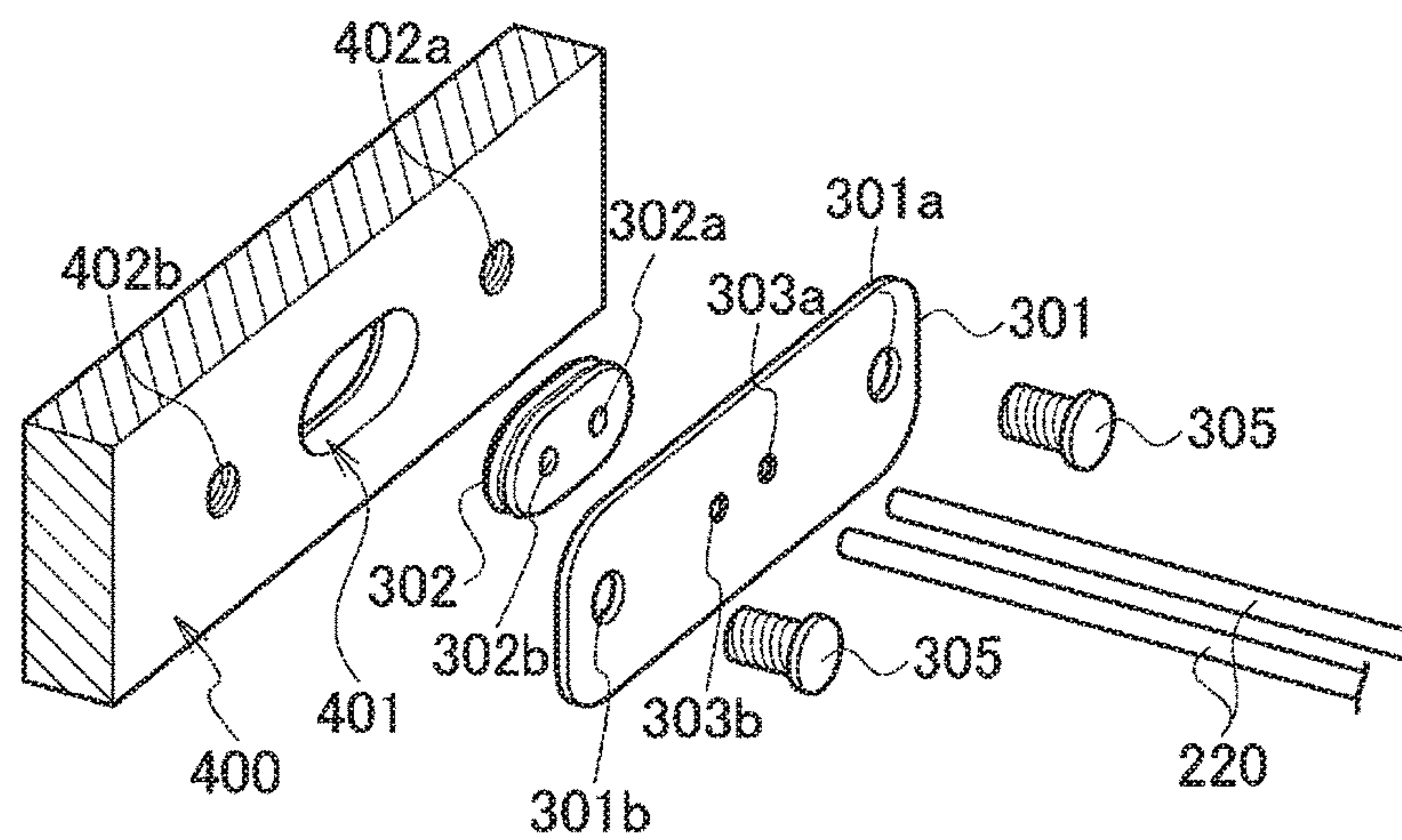
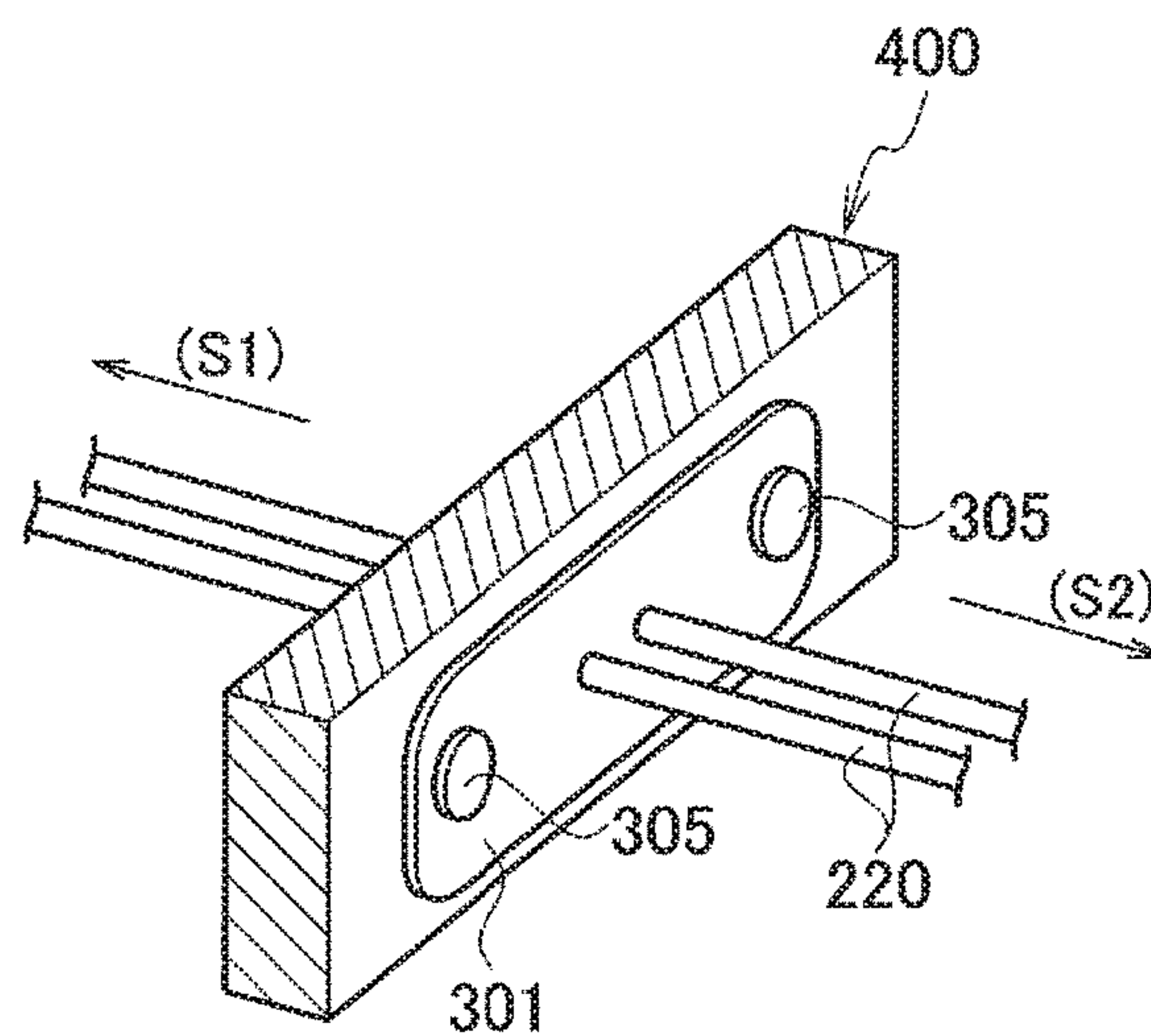


FIG. 7C





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**WATERPROOF COMPONENT WITH  
WIRING STRUCTURE****CROSS REFERENCE TO RELATED  
APPLICATIONS**

This application claims the priority of Japanese Patent Application No. 2017-061087, filed on Mar. 27, 2017, the entire content of which are incorporated herein by reference.

**BACKGROUND****Technical Field**

The present invention relates to a waterproof component for preventing water from entering various devices in which electric wires are routed over a wet area and a waterproof area.

**Related Art**

When electric wires are routed over a wet area and a waterproof area, such as a control device disposed in an engine room of an automobile, waterproof components attached to the electric wires prevent water from entering various devices where the electric wires are routed.

Techniques related to such a waterproof component are proposed in JP 2010-192396 A.

**SUMMARY**

The present invention is made in view of the above-described problems, and has an object to provide a waterproof component that can be easily attached only with a pushing work into attachment holes of a wall portion of a target device, thereby improving the efficiency of attachment work.

A waterproof component according to an aspect of the present invention is configured to insert an electric wire into an attachment hole penetrating a wall portion to lock. The waterproof component includes a housing body, a mat seal, mat seal cover, and an elastic ring. The housing body includes an attachment hole insertion portion configured to be inserted into the attachment hole, a mat seal accommodating chamber having a bottom wall being formed inside the attachment hole insertion portion, an abutting portion configured to abut a first peripheral surface of the attachment hole, a locking claw provided in an elastically deformable manner on an insertion tip side of the attachment hole insertion portion, the locking claw being configured to be locked to a second peripheral surface of the attachment hole opposite to the first peripheral surface, and a cover locking portion provided on an insertion tip side of the attachment hole insertion portion. The mat seal is configured to be accommodated in the mat seal accommodating chamber and has an electric wire press-fitting hole through which an electric wire is to penetrate. The mat seal cover is configured to be locked to the cover locking portion and to interpose the mat seal between the mat seal cover and the bottom wall of the mat seal accommodating chamber to hold the mat seal in the mat seal accommodating chamber. The elastic ring is disposed on an outer periphery of the attachment hole insertion portion and is configured to be in close contact with an inner peripheral surface of the attachment hole when the waterproof component is attached to the attachment hole.

The waterproof component according to the aspect of the present invention provides a waterproof component that can

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be easily attached only with a pushing work into attachment holes of a wall portion of a target device, thereby improving the efficiency of attachment work.

**BRIEF DESCRIPTION OF DRAWINGS**

FIG. 1 is an exploded perspective view showing a configuration example of a waterproof component according to an embodiment;

FIG. 2 is an exploded perspective view showing a configuration example of a waterproof component according to the embodiment;

FIG. 3 is a perspective view showing the overall configuration of a waterproof component according to the embodiment;

FIG. 4 is a cross-sectional view showing the overall configuration of a waterproof component according to the embodiment;

FIG. 5A is an perspective view showing a configuration example of a mat seal of the waterproof component according to the embodiment;

FIG. 5B is an perspective view showing a configuration example of a mat seal of the waterproof component according to the embodiment;

FIG. 6A is an explanatory diagram showing a process of attaching the waterproof component according to the embodiment;

FIG. 6B is an explanatory diagram showing a process of attaching the waterproof component according to the embodiment;

FIG. 7A is a perspective view showing a configuration of a waterproof component according to a comparative example;

FIG. 7B is a perspective view showing a configuration of a waterproof component according to the comparative example; and

FIG. 7C is a perspective view showing a configuration of a waterproof component according to the comparative example.

**DETAILED DESCRIPTION**

A waterproof component 1 according to an embodiment of the present invention will be described with reference to FIGS. 1 to 6B.

**Configuration Example of Waterproof Component**

The waterproof component 1 according to the embodiment of the present invention has a configuration as shown in FIGS. 1 to 6B.

Here, FIG. 1 is an exploded perspective view showing a configuration example of a waterproof component 1 according to an embodiment; FIG. 2 is an exploded perspective view showing a configuration example of a waterproof component 1; FIG. 3 is a perspective view showing the overall configuration of a waterproof component 1; FIG. 4 is a cross-sectional view showing the overall configuration of a waterproof component 1; FIGS. 5A and 5B are perspective view showing a configuration example of a mat seal 12 of the waterproof component 1; and FIGS. 6A and 6B are explanatory diagram showing a process of attaching the waterproof component 1.

As shown in FIGS. 6A and 6B and the like, a circular attachment hole 31 is formed in a wall portion 30 of a vehicle body panel, a control device, or the like. The attachment hole 31 is penetrated with electric wires 20. The



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electric wire **20** penetrates through the attachment hole **31**, thereby being routed over the wet area on one side of the wall portion **30** and the waterproof area on the other side of the wall portion **30**. An ECU and the like are disposed in one wet area (S2), and various sensors and the like are disposed in the other waterproof area (S1).

As shown in FIG. 3 and the like, the electric wires **20** are equipped with the waterproof component **1**. The attachment hole **31** of the wall portion **30** is filled with this waterproof component **1** (see FIG. 6B).

As shown in FIGS. 1 to 4, the waterproof component **1** includes a housing body **10**, a mat seal **12**, a mat seal cover **13**, and an elastic ring (O-ring) **11**.

The housing body **10** includes an attachment hole insertion portion **101** inserted into the attachment hole **31**, an abutting portion (flange portion) **116** provided on the insertion back end side of the attachment hole insertion portion **101**, a pair of left and right locking claws **101a** in the figure, and a pair of upper and lower cover locking portions **115** in the figure.

The attachment hole insertion portion **101** has substantially the same outer peripheral shape as the attachment hole **31**. A mat seal accommodating chamber **200** having a bottom wall **170** is formed inside the attachment hole insertion portion **101**.

As shown in FIG. 2, an electric wire insertion holes **170a** are formed in the bottom wall **170**.

The abutting portion **116** has a larger diameter than the attachment hole **31**. The abutting portion **116** abuts on the surface **33** on one side of the wall portion **30** of the attachment hole **31**.

The pair of locking claws **101a** are disposed in positions facing each other at 180 degrees. Each locking claw **101a** includes an elastic support wall **180** and a claw portion **181** provided at the tip of the elastic support wall **180**. The tip of each claw portion **181** protrudes outward from the outer peripheral surface of the attachment hole insertion portion **101**.

The pair of cover locking portions **115** are disposed in positions facing each other at 180 degrees. The outer peripheral surface of each cover locking portion **115** is flush with the outer peripheral surface of the attachment hole insertion portion **101**. An engagement hole **117** is formed in each cover locking portion **115**. The engagement hole **117** penetrates the inner peripheral surface and the outer peripheral surface of the cover locking portion **115**.

As shown in FIGS. 1 to 5B and the like, the mat seal **12** is made of an elastically deformable material and presents a disc shape. In the mat seal **12**, two electric wire press-fitting holes **12a**, **12b** are formed in point symmetry positions centered on the center point. The electric wire **20** penetrates through each electric wire press-fitting holes **12a**, **12b**. The gap between the outer peripheral surface of each electric wire **20** and the electric wire press-fitting holes **12a**, **12b** of the mat seal **12** is waterproofed by compressive deformation of the mat seal **12**.

Two lines of protrusions **120** are provided on the outer peripheral surface of the mat seal **12**. The mat seal **12** is press-fitted into the mat seal accommodating chamber **200** with the two lines of protrusions **120** compressed and deformed.

As shown in FIG. 1 and the like, the mat seal cover **13** is made of an elastically deformable material. Then, the mat seal cover **13** is provided with a pair of upper and lower locking protrusions **103** in the figure. Each locking protrusion **103** is formed to be elastically deformable in the vertical direction.

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The mat seal cover **13** is formed with insertion holes **13a** through which the electric wires **20** are inserted. Each insertion hole **13a** is formed in a position facing each electric wire press-fitting hole **12a**, **12b** of the mat seal **12**. In each insertion hole **13a**, an electric wire **20** penetrating the electric wire press-fitting hole **12a**, **12b** of the mat seal **12** is inserted through.

Each locking protrusion **103** is fitted into the engagement hole **117** of the housing body **10** from the inside to be locked. Thus, the mat seal **12** is interposed between the mat seal cover **13** and the bottom wall **170** to be held in the mat seal accommodating chamber **200** (see FIG. 4).

It should be noted that the number of the electric wires **20** is optional, and the number of the insertion holes of the mat seal **12** and the mat seal cover **13** is naturally changed in accordance with the number of the electric wires **20**.

Here, as shown in FIGS. 5A and 5B, the mat seal **12** is formed so that the front side **121a** and the back side **121b** have the same shape. Thus, since there is no need to distinguish the front and back sides of the mat seal **12**, the efficiency of the work of attaching the housing body **10** to the mat seal accommodating chamber **200** can be further increased.

The wall portion **30** including a vehicle body panel or the like partitions the side where the electric wires **20** are connected via at least one connector to the circuit load side (sensor side S1) and the power supply side of the electric wires **20** (electronic control unit (ECU) side S2). In the waterproof component **1** according to the present embodiment, the mat seal **12** is inserted into the mat seal accommodating chamber **200** of the housing body **10** from the circuit load side (that is, the mat seal **12** is inserted from the D1 direction shown in FIGS. 1 and 2).

Then, as shown in FIGS. 1 and 2, the tip of the electric wire **20** is inserted toward the housing body **10** from the D2 direction, and inserted through the electric wire press-fitting holes **12a** and **12b** of the mat seal **12** and the insertion hole **13a** of the mat seal cover **13**; thus, the waterproof component **1** according to the present embodiment is produced.

In the present embodiment, since the mat seal **12** is inserted into the mat seal accommodating chamber **200** of the housing body **10** from the circuit load side and held by the bottom wall **170**, even when the electric wire **20** is pulled toward the ECU after the waterproof component **1** is attached to the wall portion **30**, it is possible to avoid a situation where the mat seal **12** is detached from the housing body **10** by the pulling force.

In addition, in the waterproof component **1** according to the present embodiment, as shown in FIG. 4, the mat seal **12** is fixed in such a manner as to be interposed between the housing body **10** and the mat seal cover **13**. Therefore, even when the electric wire **20** is pulled toward the sensor side (S1 side) or the ECU side (S2 side), the mat seal **12** does not come out from the housing body **10**, and the waterproof effect can be surely exhibited.

By the way, the waterproof component **300** according to the reference example as shown in FIGS. 7A to 7C includes a metal plate member **301** having insertion holes **303a** and **303b** through which electric wires **220** are passed and screwing holes **301a** and **301b**, and a rubber-made sealing member **302** having insertion holes **302a** and **302b**.

As shown in FIG. 7A, the waterproof component **300** has a state in which the electric wires **220** are passed through the plate member **301** and the sealing member **302** from the electronic control unit (ECU) side (S2 side) to the sensor side (S1 side) as the connection destination.



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Then, in the waterproof component **300**, the sealing member **302** is fitted to the wall portion **400** of the housing of the control device or the like having the fitting hole **401** and the screw holes **402a** and **402b**, and thereafter the plate member **301** abuts the wall portion to be fixed with screws **305**.

Thus, in the waterproof component **300** according to the reference example, a plurality of attaching processes such as a sealing member fitting process and a plate member screwing process are required, and there is a difficulty that this takes much time and effort in the attaching work to be inferior in the working efficiency.

## Attaching Process

Next, the attaching process of the waterproof component **1** will be described with reference to FIGS. **6A** and **6B**.

First, as shown in FIG. **6A**, the attachment hole insertion portion **101** side of the waterproof component **1** is caused to face the attachment hole **31** formed in the wall portion **30** of the vehicle body panel or the like. Then, with the tip of the electric wire **20** inserted in the attachment hole **31**, the waterproof component **1** is pressed toward the D3 direction.

Thus, the tip of the claw portion **181** of each of the locking claws **101a** makes sliding contact with the inner wall of the attachment hole **31**, and the elastic support wall **180** elastically deforms inward.

Next, when the claw portion **181** of the locking claw **101a** reaches the back surface of the wall portion **30** to be exposed, the elastic support wall **180** returns to the original position by elasticity, and as shown in FIG. **6B**, the claw portion **181** is locked to the peripheral surface **35** of the attachment hole **31**. In this case, the abutting portion **116** of the waterproof component **1** abuts the peripheral surface **33** of the attachment hole **31** opposite to the surface **35** to which the claw portion **181** in the wall portion **30** is locked.

Thus, the waterproof component **1** is fixed to the wall portion **30** of the vehicle body panel or the like.

As described above, according to the waterproof component **1** according to the present embodiment, the attachment work can be completed by a simple work of simply pressing the waterproof component **1** against the attachment hole **31** to be attached.

In particular, as in the reference example, since the screwing work for fixing the waterproof component is unnecessary, it is possible to reduce the labor and time required for the work to improve the efficiency of the attachment work.

It should be noted that in the attached state as shown in FIG. **6B**, in the waterproof component **1**, the waterproof effect relating to the electric wire **20** is fulfilled by the close

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contact between the outer peripheral surface of the electric wire **20** and the electric wire press-fitting hole **12a** of the mat seal **12**. Then, the waterproof effect between the waterproof component **1** and the wall portion **30** is fulfilled by the close contact between the elastic ring (O ring) **11** and the inner peripheral surface of the wall portion **30**.

As described above, although the waterproof component of the present invention is described based on the illustrated embodiment, the present invention is not limited thereto, and the configuration of each part can be replaced with any configuration having the same function.

What is claimed is:

**1.** A waterproof component configured to insert an electric wire into an attachment hole penetrating a wall portion to lock, the waterproof component comprising:

a housing body including:

an attachment hole insertion portion configured to be inserted into the attachment hole, a mat seal accommodating chamber having a bottom wall being formed inside the attachment hole insertion portion; an abutting portion configured to abut a first peripheral surface of the attachment hole;

a locking claw provided in an elastically deformable manner on an insertion tip side of the attachment hole insertion portion, the locking claw being configured to be locked to a second peripheral surface of the attachment hole opposite to the first peripheral surface; and

a cover locking portion provided on the insertion tip side of the attachment hole insertion portion;

a mat seal accommodated in the mat seal accommodating chamber, the mat seal having an electric wire press-fitting hole configured to receive an electric wire therein;

a mat seal cover locked to the cover locking portion, the mat seal cover interposing the mat seal between the mat seal cover and the bottom wall to hold the mat seal in the mat seal accommodating chamber; and

an elastic ring disposed on an outer periphery of the attachment hole insertion portion, the elastic ring being in contact with an inner peripheral surface of the attachment hole.

**2.** The waterproof component according to claim **1**, wherein

the wall portion partitions a side on which the electric wire is connected via a connector to a circuit load side and a power side of the electric wire, and

the mat seal is inserted into the mat seal accommodating chamber of the housing body from the circuit load side.

\* \* \* \* \*